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Kim et al.

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(54) **APPARATUS AND METHOD FOR TREATING GARMENTS**

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D06F 34/05 (2020.01)
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CPC ***D06F 34/05*** (2020.02); ***D06F 33/32*** (2020.02); ***D06F 33/52*** (2020.02); *D06F 33/60* (2020.02);
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(58) **Field of Classification Search**
CPC D06F 33/60; D06F 33/70; D06F 35/006; D06F 2105/48; D06F 39/024; D06F 34/05; D06F 33/52; D06F 33/32
See application file for complete search history.

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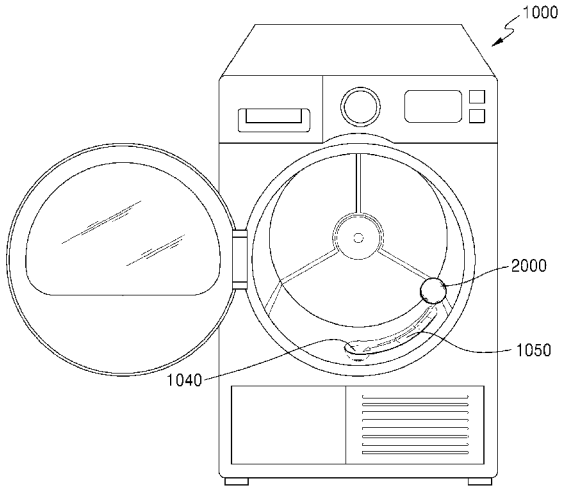
(57) **ABSTRACT**

An apparatus and a method for treating garments are provided. A method, performed by a garment treatment apparatus, of controlling an operation of the garment treatment apparatus includes: establishing wireless communication with a monitoring device placed inside a drum of the garment treatment apparatus; rotating the drum; receiving movement information associated with movement of the monitoring device from the monitoring device during the rotation of the drum; and controlling the rotation of the drum based on the received movement information.

18 Claims, 13 Drawing Sheets



(51) **Int. Cl.**

D06F 33/32	(2020.01)
D06F 33/60	(2020.01)
D06F 33/70	(2020.01)
D06F 103/08	(2020.01)
D06F 105/48	(2020.01)
D06F 105/56	(2020.01)
D06F 103/24	(2020.01)
D06F 39/02	(2006.01)

(52) **U.S. Cl.**

CPC *D06F 33/70* (2020.02); *D06F 39/024* (2013.01); *D06F 2103/08* (2020.02); *D06F 2103/24* (2020.02); *D06F 2105/48* (2020.02); *D06F 2105/56* (2020.02)

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FIG. 1

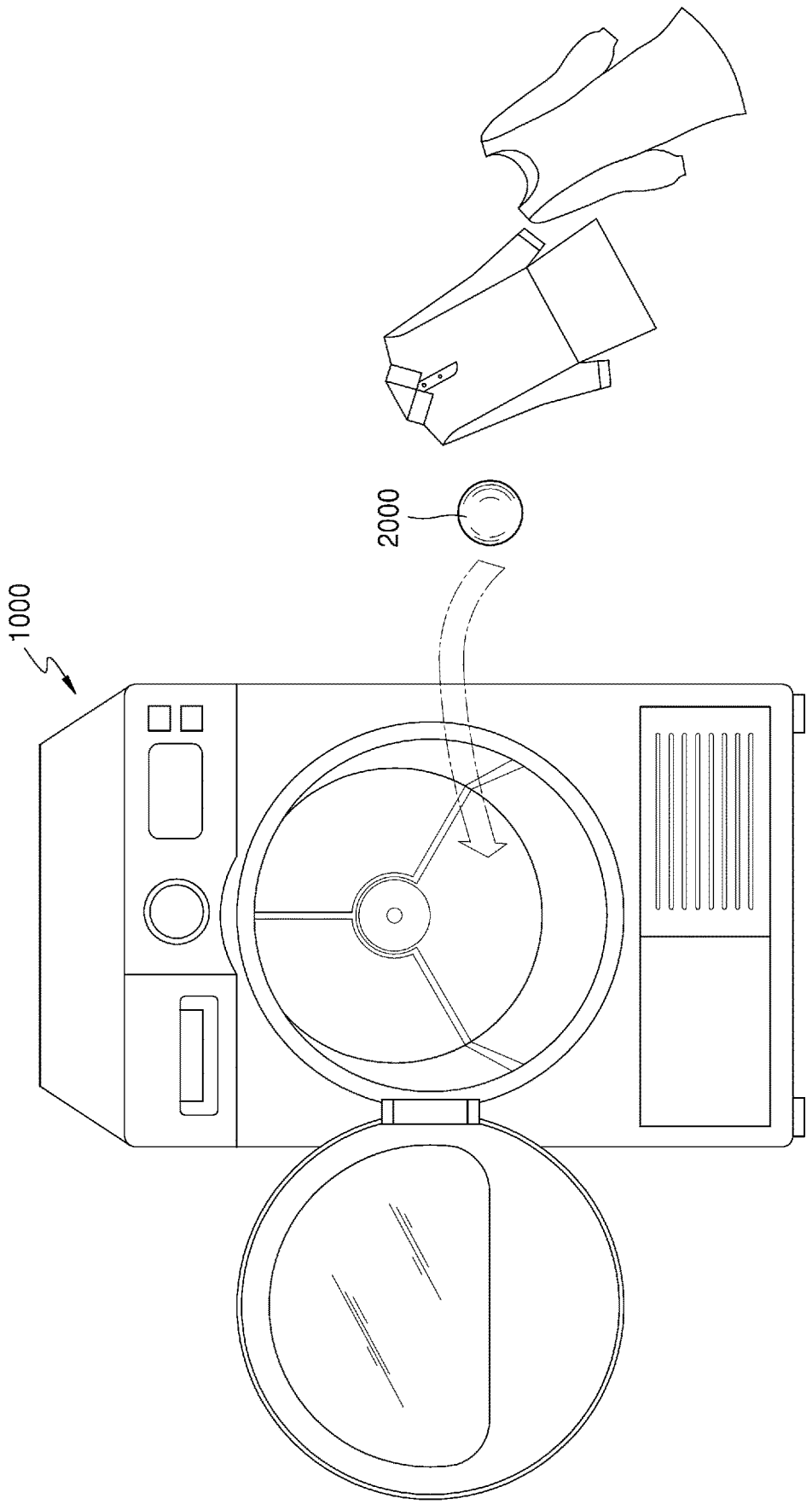


FIG. 2

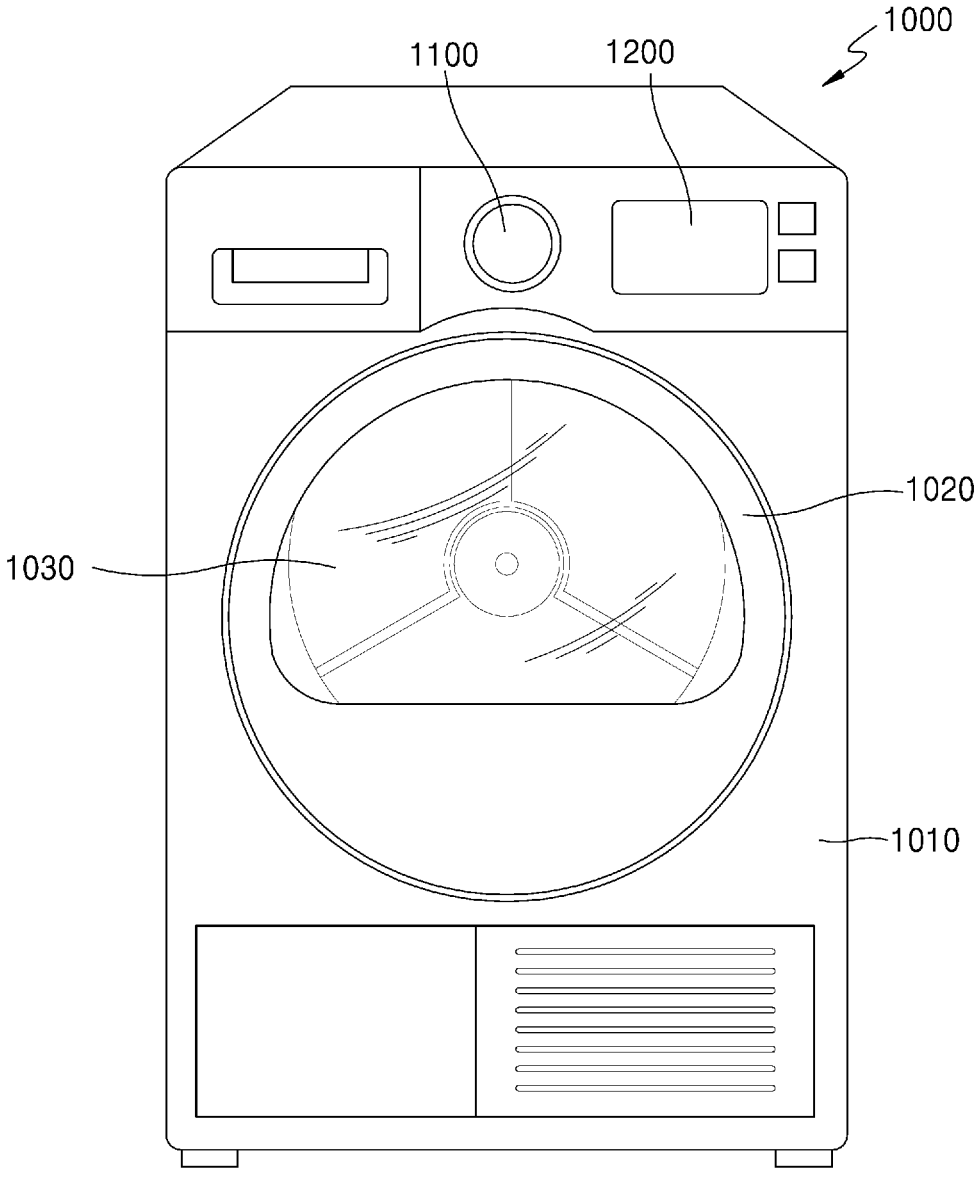


FIG. 3

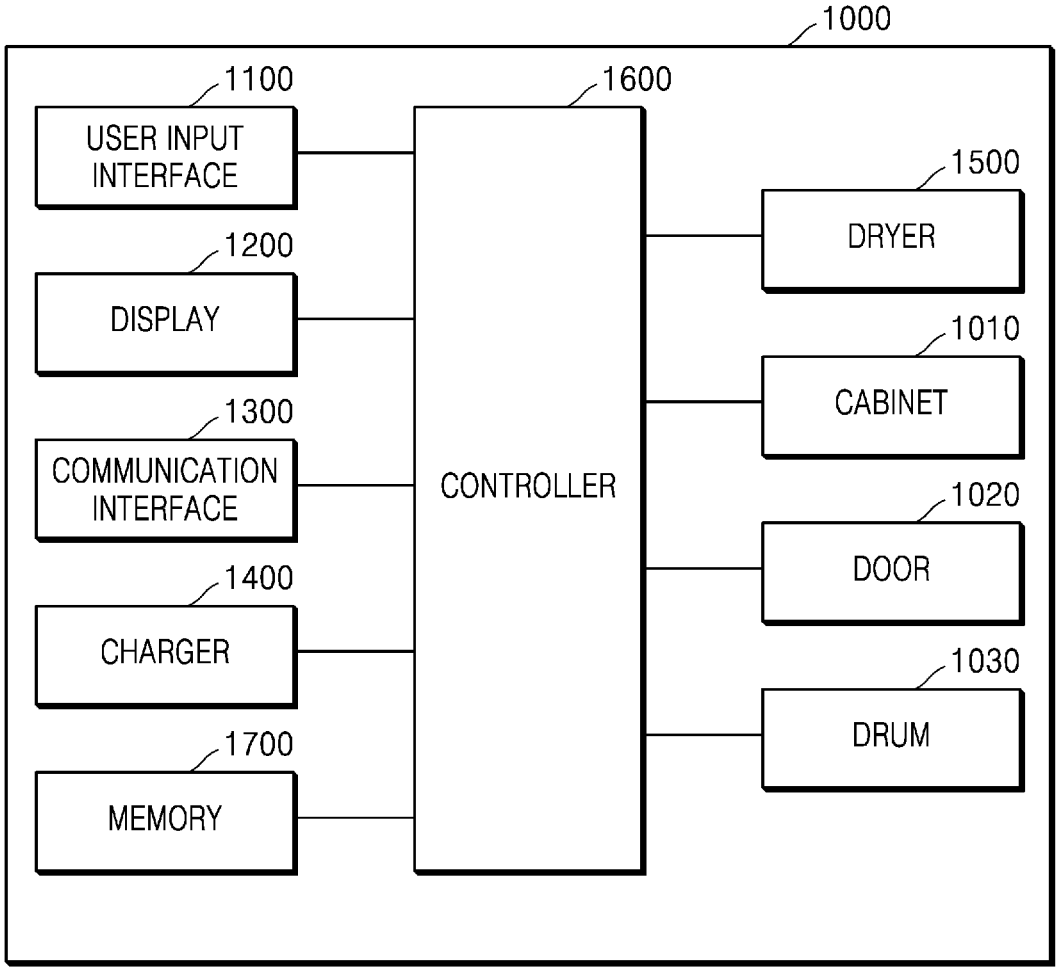

1000
1100
USER INPUT INTERFACE
1200
DISPLAY
1300
COMMUNICATION INTERFACE
1400
CHARGER
1700
MEMORY
1600
CONTROLLER
1500
DRYER
1010
CABINET
1020
DOOR
1030
DRUM

FIG. 4

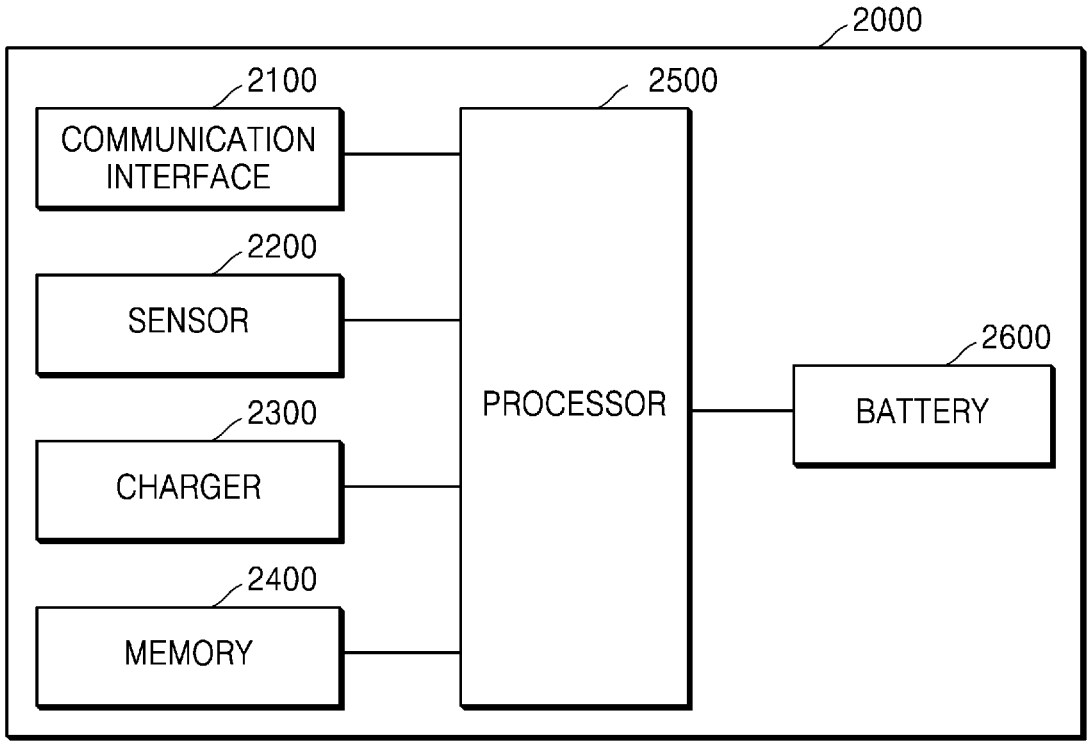

2000
2100
COMMUNICATION INTERFACE
2200
SENSOR
2300
CHARGER
2400
MEMORY
2500
PROCESSOR
2600
BATTERY

FIG. 5

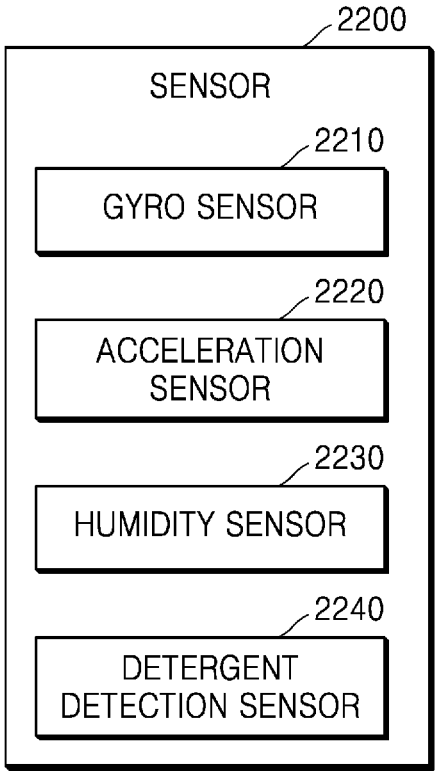

2200
SENSOR
2210
GYRO SENSOR
2220
ACCELERATION SENSOR
2230
HUMIDITY SENSOR
2240
DETERGENT DETECTION SENSOR

FIG. 6

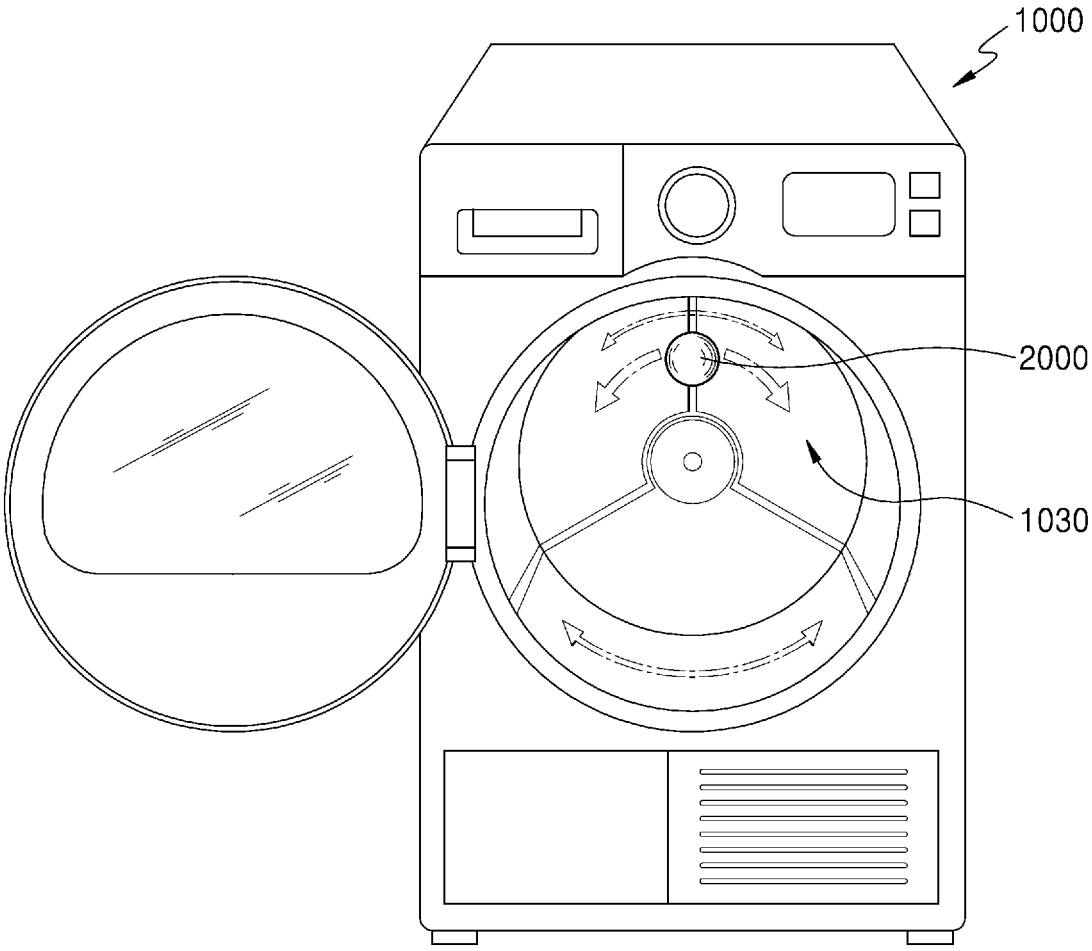


FIG. 7

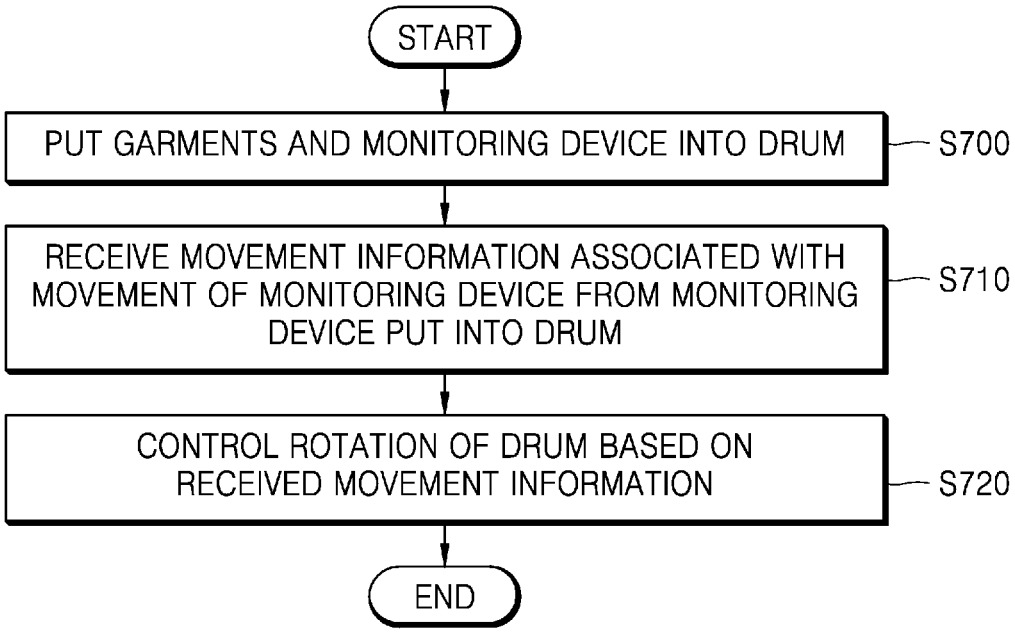

START
PUT GARMENTS AND MONITORING DEVICE INTO DRUM
S700
RECEIVE MOVEMENT INFORMATION ASSOCIATED WITH MOVEMENT OF MONITORING DEVICE FROM MONITORING DEVICE PUT INTO DRUM
S710
CONTROL ROTATION OF DRUM BASED ON RECEIVED MOVEMENT INFORMATION
S720
END

FIG. 8

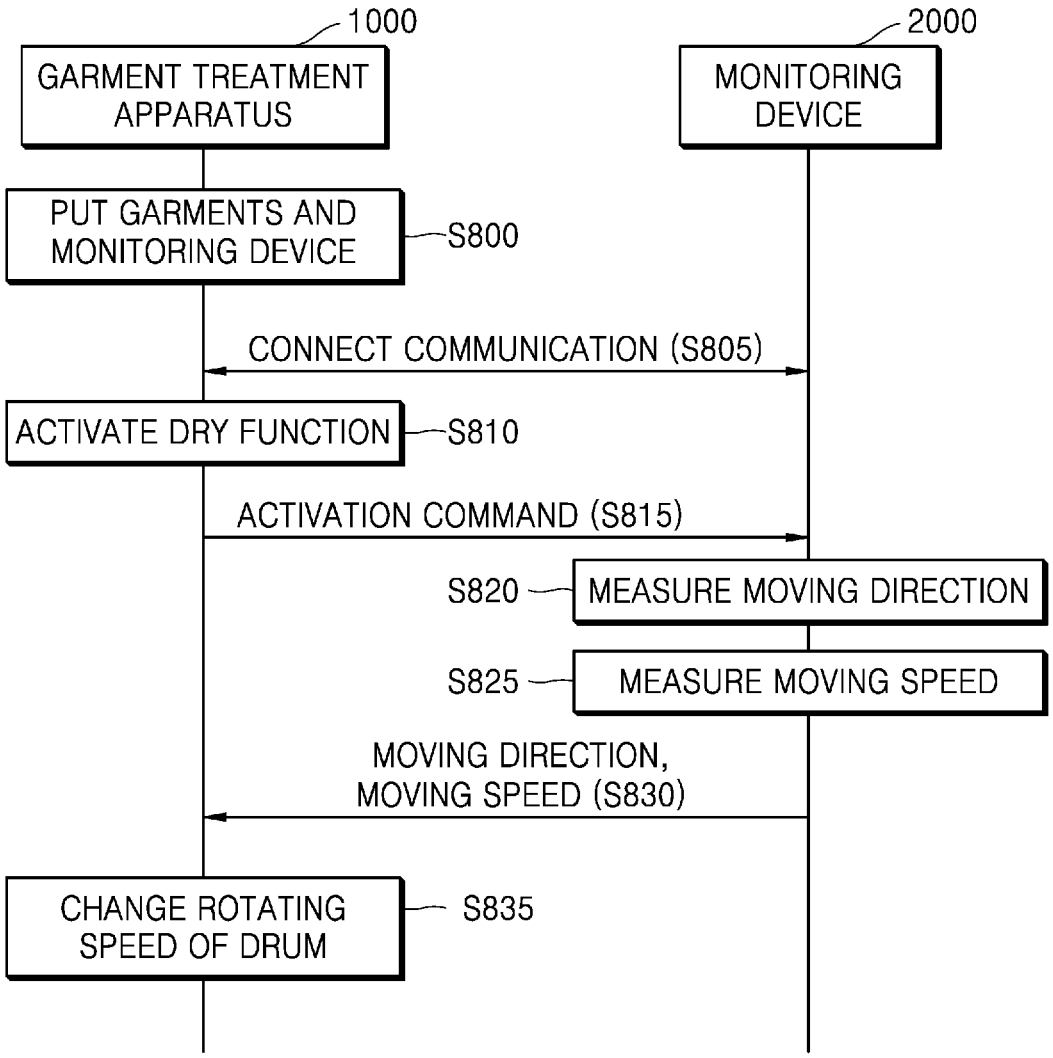

1000
GARMENT TREATMENT APPARATUS
2000
MONITORING DEVICE
PUT GARMENTS AND MONITORING DEVICE
S800
CONNECT COMMUNICATION (S805)
ACTIVATE DRY FUNCTION
S810
ACTIVATION COMMAND (S815)
S820
MEASURE MOVING DIRECTION
S825
MEASURE MOVING SPEED
MOVING DIRECTION, MOVING SPEED (S830)
CHANGE ROTATING SPEED OF DRUM
S835

FIG. 9

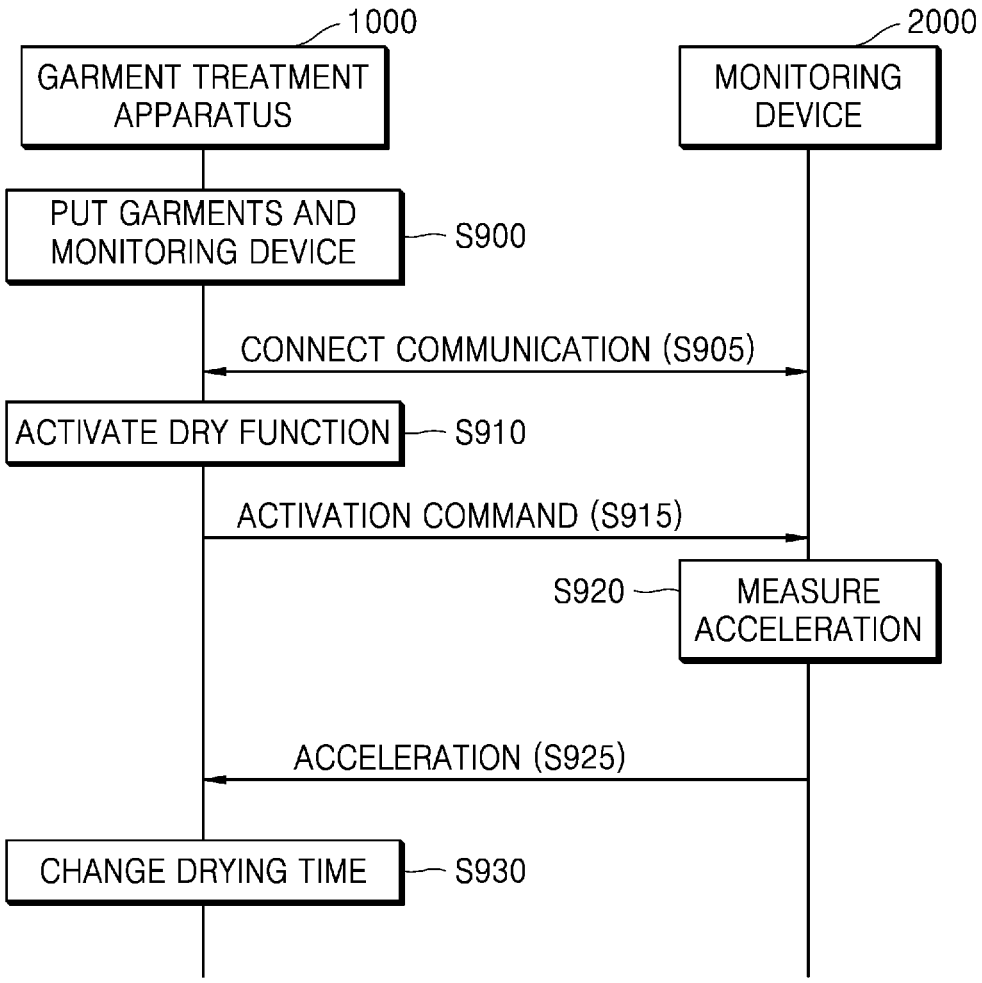

1000
GARMENT TREATMENT APPARATUS
2000
MONITORING DEVICE
PUT GARMENTS AND MONITORING DEVICE
S900
CONNECT COMMUNICATION (S905)
ACTIVATE DRY FUNCTION
S910
ACTIVATION COMMAND (S915)
S920
MEASURE ACCELERATION
ACCELERATION (S925)
CHANGE DRYING TIME
S930

FIG. 10

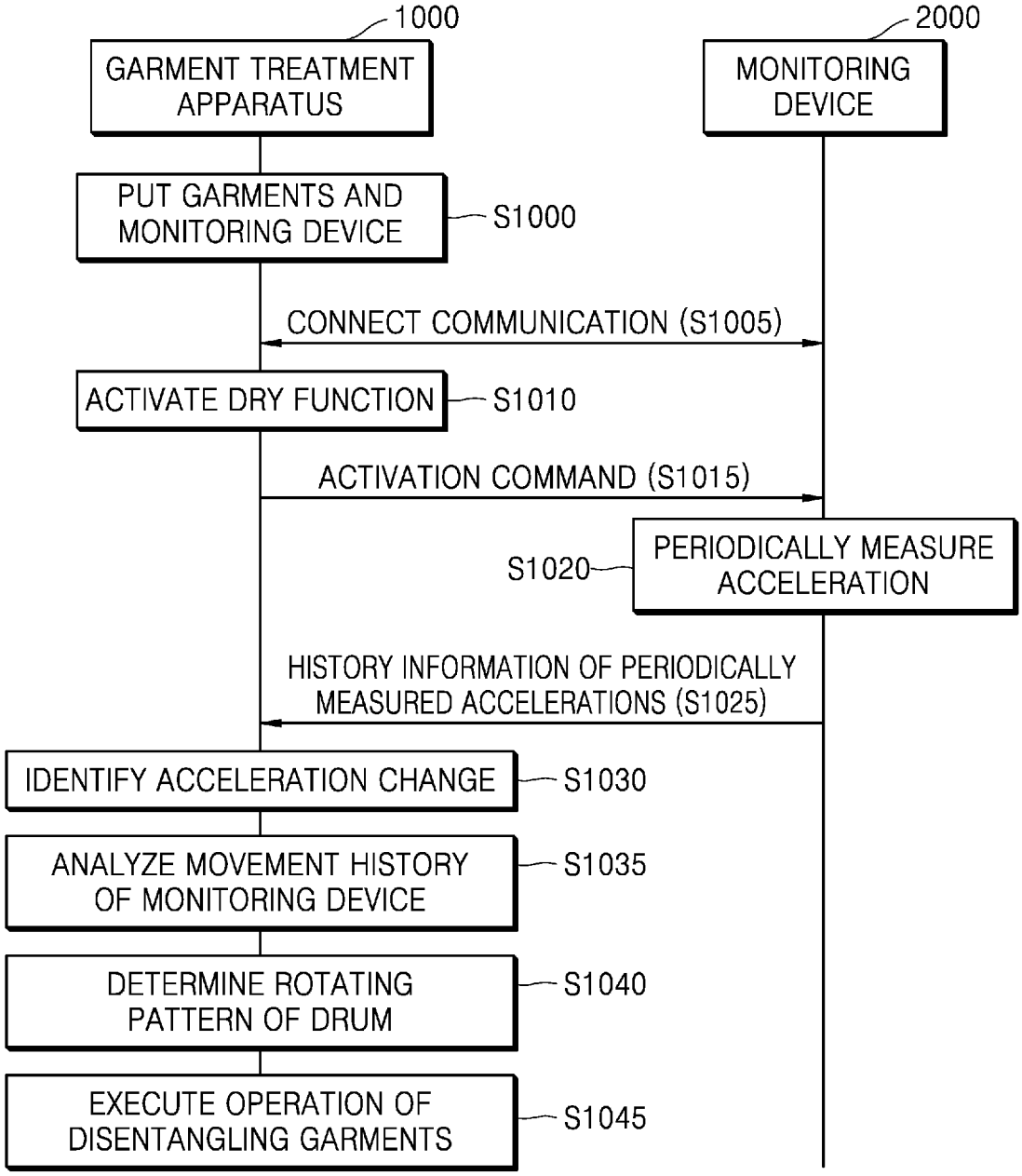

1000
GARMENT TREATMENT APPARATUS
2000
MONITORING DEVICE
PUT GARMENTS AND MONITORING DEVICE
S1000
CONNECT COMMUNICATION (S1005)
ACTIVATE DRY FUNCTION
S1010
ACTIVATION COMMAND (S1015)
S1020
PERIODICALLY MEASURE ACCELERATION
HISTORY INFORMATION OF PERIODICALLY MEASURED ACCELERATIONS (S1025)
IDENTIFY ACCELERATION CHANGE
S1030
ANALYZE MOVEMENT HISTORY OF MONITORING DEVICE
S1035
DETERMINE ROTATING PATTERN OF DRUM
S1040
EXECUTE OPERATION OF DISENTANGLING GARMENTS
S1045

FIG. 11

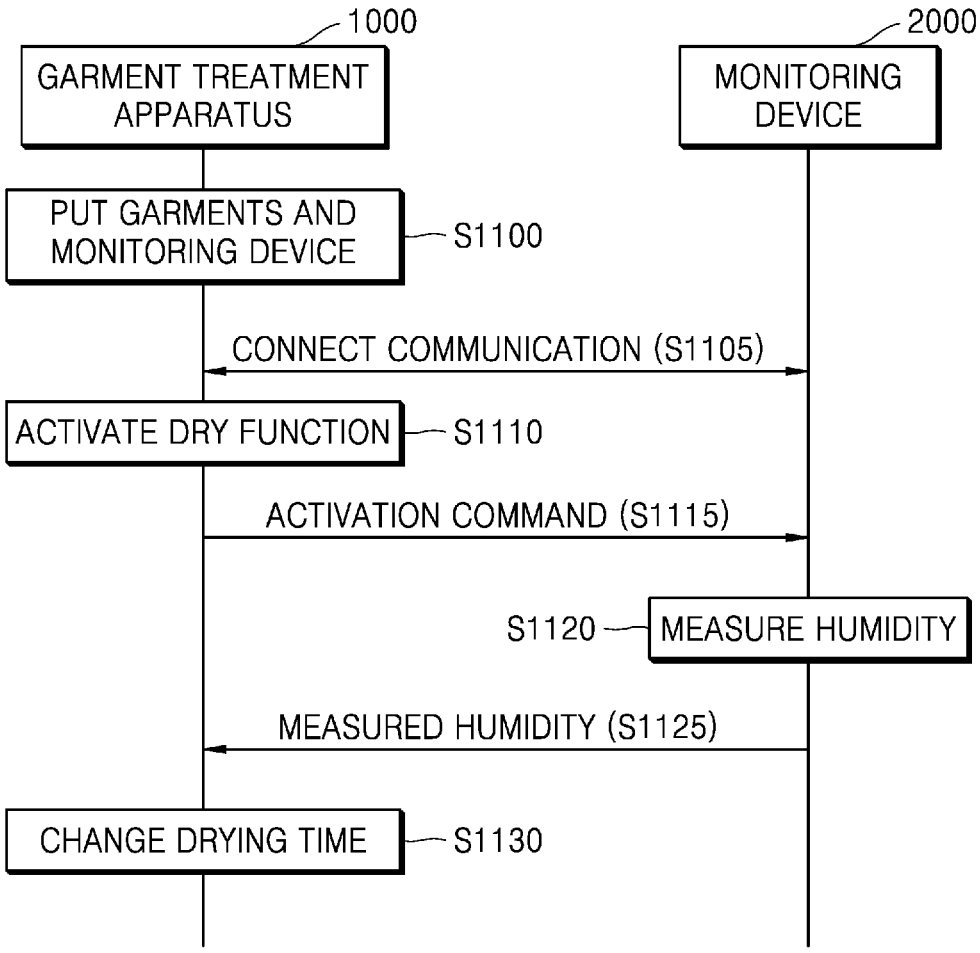

1000
GARMENT TREATMENT APPARATUS
2000
MONITORING DEVICE
PUT GARMENTS AND MONITORING DEVICE
S1100
CONNECT COMMUNICATION (S1105)
ACTIVATE DRY FUNCTION
S1110
ACTIVATION COMMAND (S1115)
S1120
MEASURE HUMIDITY
MEASURED HUMIDITY (S1125)
CHANGE DRYING TIME
S1130

FIG. 12

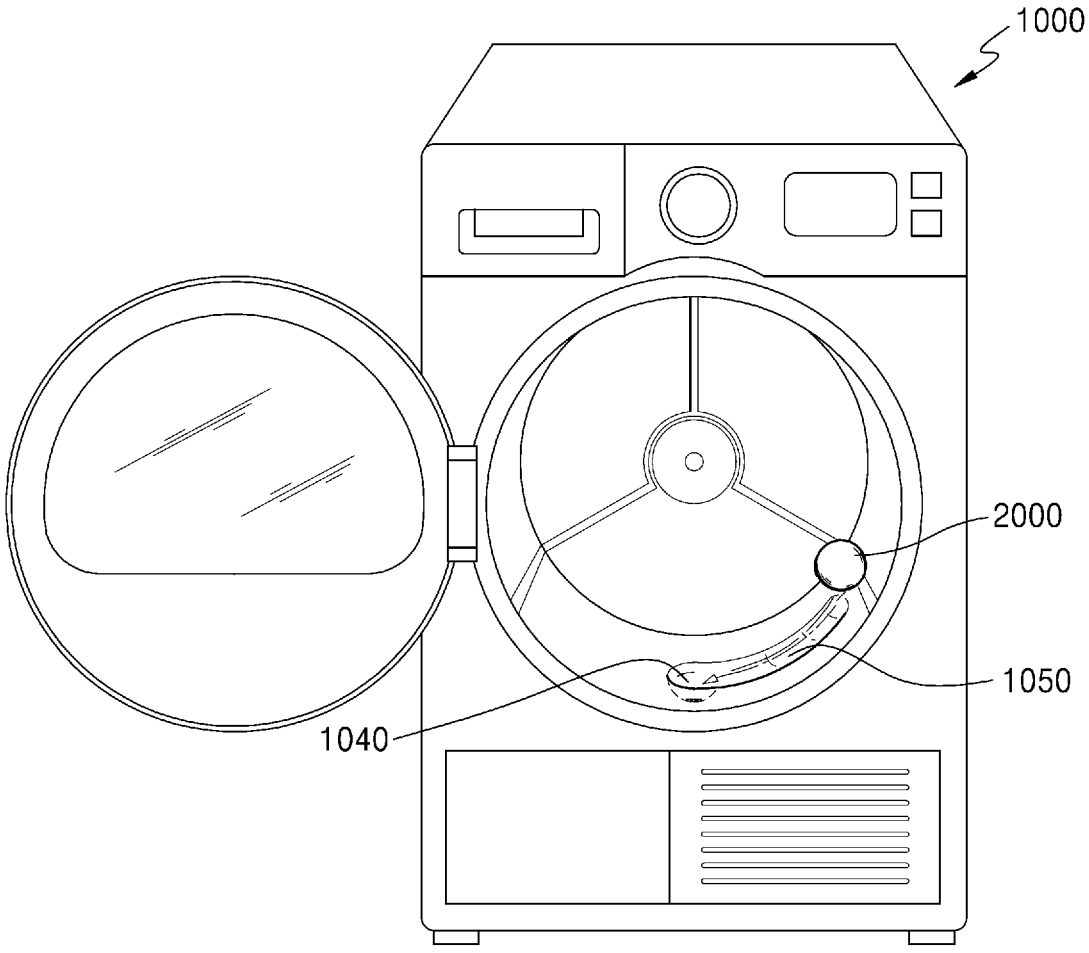
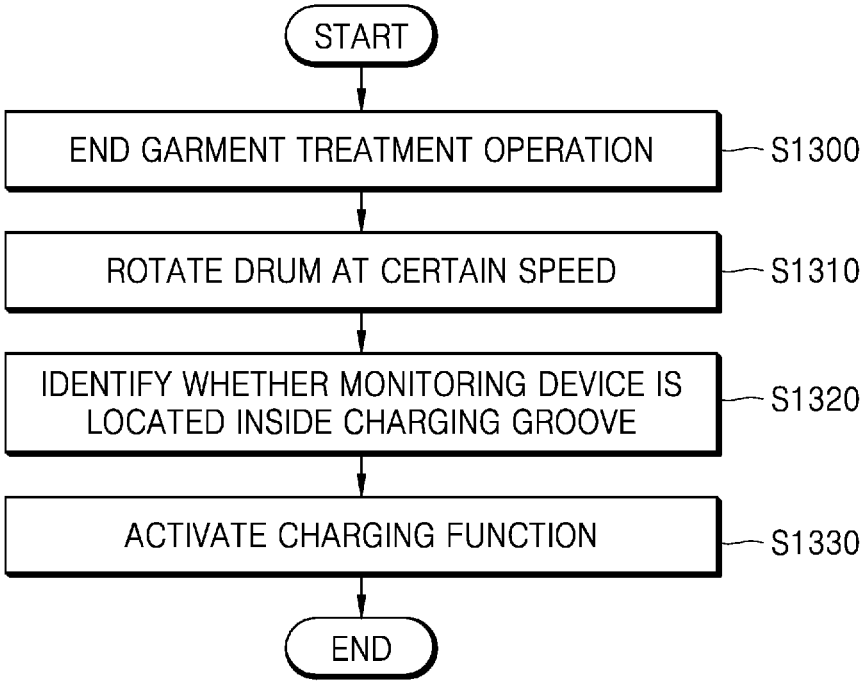


FIG. 13


START
END GARMENT TREATMENT OPERATION
S1300
ROTATE DRUM AT CERTAIN SPEED
S1310
IDENTIFY WHETHER MONITORING DEVICE IS LOCATED INSIDE CHARGING GROOVE
S1320
ACTIVATE CHARGING FUNCTION
S1330
END

APPARATUS AND METHOD FOR TREATING GARMENTS

CROSS-REFERENCE TO RELATED APPLICATION

This application is based on and claims priority under 35 U.S.C. § 119 to Korean Patent Application No. 10-2019-0017962, filed on Feb. 15, 2019, in the Korean Intellectual Property Office, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

1. Field

The disclosure relates to an apparatus and method for treating garments, and more particularly, to an apparatus and a method for treating garments by communicating with a monitoring device.

2. Description of Related Art

In general, garment treatment apparatuses are home appliances for treating garments and may include a washer, a dryer, and the like. The garment treatment apparatuses may be classified into apparatuses having a drum standing in a vertical direction and apparatuses having a drum lying in a horizontal direction. The garment treatment apparatuses need to effectively treat garments by controlling a strength and a treatment time for treating the garments while rotating a drum accommodating the garments therein.

Accordingly, there is demand for a technique capable of effectively treating the garments in the drum by more accurately monitoring a state of the garments in the drum while treating the garments.

SUMMARY

According to an embodiment of the disclosure, provided are an apparatus and method for treating garments by using movement information of a monitoring device moving in a drum together with the garments.

According to an embodiment of the disclosure, provided are a garment treatment apparatus and method capable of adjusting a motion of a drum by using movement information of a monitoring device moving in the drum together with garments.

According to an embodiment of the disclosure, provided are a garment treatment apparatus and method capable of adjusting a garment treatment time by using movement information of a monitoring device moving in the drum together with garments.

According to an embodiment of the disclosure, provided are a garment treatment apparatus and method capable of disentangling garments by using movement information of a monitoring device moving in the drum together with the garments.

Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented embodiments of the disclosure.

According to an aspect of the disclosure, a method, performed by a garment treatment apparatus, of controlling an operation of the garment treatment apparatus includes: establishing wireless communication with a monitoring device placed inside a drum of the garment treatment apparatus; rotating the drum to treat garments; receiving movement information associated with movement of the monitoring device from the monitoring device during the rotating of the drum; and controlling the rotating of the drum based on the movement information received, wherein the monitoring device moves in the drum, that is rotating, together with the garments in the garment treatment apparatus.

According to another aspect of the disclosure, a garment treatment apparatus includes: a communication interface configured to wirelessly communicate with a monitoring device; a drum configured to accommodate garments and the monitoring device therein; a memory storing one or more instructions; and a controller configured to execute the one or more instructions stored in the memory, wherein the controller is further configured, by executing the one or more instructions, to establish wireless communication with the monitoring device placed inside the drum, rotate the drum to treat the garments, receive movement information associated with movement of the monitoring device from the monitoring device during the rotating of the drum, and control the rotating of the drum based on the movement information received, wherein, in a case where the drum is rotating, the monitoring device moves in the drum together with the garments in the garment treatment apparatus.

According to another aspect of the disclosure, a monitoring device configured to be placed inside a garment treatment apparatus includes: a communication interface configured to wirelessly communicate with the garment treatment apparatus; a sensor; a memory storing one or more instructions; and a processor configured to execute the one or more instructions stored in the memory, wherein the processor is further configured, by executing the one or more instructions, to form wireless communication with the garment treatment apparatus, sense movement of the monitoring device caused by rotation of a drum of the garment treatment apparatus during the rotation, of the drum, and provide sensing data associated with the movement of the monitoring device to the garment treatment apparatus, wherein, in a case where the drum is rotating, the monitoring device moves in the drum together with garments in the garment treatment apparatus, and the sensing data that is provided, is used by the garment treatment apparatus to control the rotation of the drum to treat the garments.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features, and advantages of certain embodiments of the disclosure will be more apparent from the following description taken in conjunction with the accompanying drawings, in which;

FIG. **1** illustrates an example in which a garment treatment apparatus treats garments by using a monitoring device, according to an embodiment of the disclosure;

FIG. **2** is a front view of the garment treatment apparatus according to an embodiment of the disclosure;

FIG. **3** is a block diagram of the garment treatment apparatus according to an embodiment of the disclosure;

FIG. **4** is a block diagram of the monitoring device according to an embodiment of the disclosure;

FIG. **5** is a block diagram of a sensor according to an embodiment of the disclosure;

FIG. **6** illustrates n example in which the monitoring device moves in the garment treatment apparatus, according to an embodiment of the disclosure;

FIG. **7** is a flowchart of a method, performed by the garment treatment apparatus, of controlling an operation of

the garment treatment apparatus by interworking with the monitoring device, according to an embodiment of the disclosure;

FIG. **8** is a signaling diagram of a method, performed by the garment treatment apparatus, of changing a rotating speed of a drum of the garment treatment apparatus based on a moving direction and a moving speed of the monitoring device, according to an embodiment of the disclosure;

FIG. **9** is a signaling diagram of a method, performed by the garment treatment apparat is, of changing a drying time of the garment treatment apparatus based on an acceleration of the monitoring device, according to an embodiment of the disclosure;

FIG. **10** is a signaling diagram of a method, performed by the garment treatment apparatus, of disentangling garments in the garment treatment apparatus based on an acceleration change of the monitoring device, according to an embodiment of the disclosure;

FIG. **11** is a signaling diagram of a method, performed by the garment treatment apparatus, of changing a drying time of the garment treatment apparatus based on ambient humidity of the monitoring device, according to an embodiment of the disclosure;

FIG. **12** illustrates an example in which the garment treatment apparatus charges the monitoring device, according to an embodiment of the disclosure; and

FIG. **13** is a flowchart of a method, performed by the garment treatment apparatus, of charging the monitoring device, according to an embodiment of the disclosure.

DETAILED DESCRIPTION

Hereinafter, embodiments of the disclosure will be described in detail with reference to the accompanying drawings so that those of ordinary skill in the art may easily realize the disclosure. However, the disclosure may be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. In addition, in the drawings, parts irrelevant to the description are omitted to clearly describe the disclosure and like reference numerals denote like elements throughout the specification.

Throughout the disclosure, the expression "at least one of a, b or c" indicates only a, only b, only c, both a and b, both a and c, both b and c, all of a, b, and c, or variations thereof.

Throughout the specification, when it is described that a certain part is "connected" to another part, it should be and understood that the certain part may be "directly connected" or "electrically connected" to another part via another element in the middle. In addition, when a certain part "includes" a certain component, this indicates that the part may further include another component instead of excluding another component unless there is different disclosure.

Hereinafter, the disclosure will be described in detail with reference to the accompanying drawings.

FIG. **1** illustrates an example in which a garment treatment apparatus **1000** treats garments by using a monitoring device **2000**, according to an embodiment of the disclosure.

Referring to FIG. **1**, the garment treatment apparatus **1000** is an apparatus for treating garments and may perform a function of treating garments placed inside the garment treatment apparatus **1000**. The garment treatment apparatus **1000** may be, for example, a home appliance such as a washer or a dryer and may include a rotatable drum. In addition, the garment treatment apparatus **1000** may treat garments by executing functions, e.g., drying, washing, rinsing, dehydrating, and the like.

The monitoring device **2000** is a device placed inside the garment treatment apparatus **1000** together with garments and may move inside the drum together with the garments according to rotation of the drum. The monitoring device **2000** may be connected, via communication to the garment treatment apparatus **1000** and transmit movement information associated with movement of the monitoring device **2000** to the garment treatment apparatus **1000** in the middle of treating garments by the garment treatment apparatus **1000**. The monitoring device **2000** may have a shape close to a spherical shape, e.g., a ball-like shape.

In addition, the garment treatment apparatus **1000** may execute or change an operation for treating garments according to preset criteria based on movement information of the monitoring device **2000** moving together with garments inside the drum.

FIG. **2** is a front view of the garment treatment apparatus **1000** according to an embodiment of the disclosure and FIG. **3** is a block diagram of the garment treatment apparatus **1000** according to an embodiment of the disclosure.

Referring to FIGS. **2** and **3**, the garment treatment apparatus **1000** according to an embodiment of the disclosure may include a cabinet **1010**, a door **1020**, a drum **1030**, a user input interface **1100**, a display **1200**, a communication interface **1300**, a charger **1400**, a dryer **1500**, a controller **1600**, and a memory **1700**.

The cabinet **1010** may be a housing establishing an exterior of the garment treatment apparatus **1000**, and the door **1020** provided to one side of the cabinet **1010** may open or close an opening at the one side of the cabinet **1010**. When the door **1020** provided to the one side of the cabinet **1010** is opened, external garments and the monitoring device **2000** may be placed inside the drum **1030** through the opening of the cabinet **1010**. The drum **1030** may be rotatably provided to the inside of the cabinet **1010**, and rotation of the drum **1030** may cause the garments and the monitoring device **2000** inside the drum **1030** to move.

The user input interface **1100** may be a means through which a user inputs data for controlling the garment treatment apparatus **1000**. For example, the user input interface **1100** may include a keypad, a dome switch, a touch pad (a capacitive overlay touch pad, a resistive overlay touch pad, an infrared (IR) beam touch pad, a surface acoustic wave touch pad, an integral strain gauge touch pad, a piezoelectric touch pad, or the like), a jog wheel, a jog switch, and the like but is not limited thereto.

The user input interface **1100** may receive the user's input to control the garment treatment apparatus **1000**. The user input interface **1100** may have a rotatable knob shape, and the user may apply power to the garment treatment apparatus **1000** through the user input interface **1100**. In addition, the user may rotate the user input interface **1100** to select a garment treatment course and to operate the garment treatment apparatus **1000**. The garment treatment course ay include, for example, standard drying, rapid drying, bedclothes dusting, washing, rinsing, dehydrating, and the like but is not limited thereto. In addition, the user may also set a drying strength, a rotating speed of the drum **1030**, a drying time, and the like through the user input interface **1100**.

The display **1200** may display information processed by the garment treatment apparatus **1000**. For example, the display **1200** may display a user interface (UI) for controlling the garment treatment apparatus **1000**, information associated with a garment treatment course, and a garment treatment state. When the display **1200** and a touch pad form a layer structure to configure a touchscreen, the display **1200**

may be used as not only an output device but also an input device. The display **1200** may include at least one of a liquid crystal display, a thin-film transistor liquid crystal display, an organic light-emitting diode display, a flexible display, a three-dimensional (3D) display, or an electrophoretic display.

The communication interface **1300** may include one or more components for communicating with the monitoring device **2000**, a mobile device (not shown), and a server (not shown). For example, the communication interface **1300** may include a short-range wireless communication interface and a mobile communication interface. The short-range wireless communication interface may include a Bluetooth communication interface, a Bluetooth low energy (BLE) communication interface, a near field communication (NFC) interface, a Wi-Fi communication interface, a Zigbee communication interface, an infrared data association (IrDA) communication interface, a Wi-Fi Direct (WFD) communication interface, an ultra-wideband (UWB) communication interface, an Ant+ communication interface, and the like but is not limited thereto. The mobile communication interface may transmit and receive a wireless signal to and from at least one of a base station, an external terminal, or a server in a mobile communication network.

The charger **1400** may charge the monitoring device **2000**. The charger **1400** may charge the monitoring device **2000** seated on a charging groove inside the drum **1030**, in a wireless or wired manner. When the charger **1400** charges the monitoring device **2000** in a wired manner, the charger **1400** may charge the monitoring device **2000** through a charging terminal in the charging groove inside the drum **1030** or a charging terminal of the monitoring device **2000**.

The dryer **1500** may dry garments. The dryer **1500** may provide hot wind to the inside of the drum **1030** under control of the controller **1600**. The dryer **1500** may remove humidity inside the drum **1030** through a certain dehumidification function under control of the controller **1600**.

The memory **1700** may store a program for controlling the garment treatment apparatus **1000** and store data input to the garment treatment apparatus **1000** or data to be output from the garment treatment apparatus **1000**. The memory **1700** may include at least one type of storage medium among a flash memory type memory, a hard disk type memory, a multimedia card micro type memory, a card type memory (e.g., a secure digital (SD) or extreme digital (XD) memory), random access memory (RAM), static RAM (SRAM), read only memory (ROM) electrically erasable programmable ROM (EEPROM), PROM, a magnetic memory, a magnetic disc, and an optical disc. Programs stored in the memory **1700** may be classified into a plurality of modules according to functions thereof, e.g., a UI module, a touchscreen module, and the like.

The controller **1600** controls a general operation of the garment treatment apparatus **1000**. For example, the controller **1600** may generally control the door **1020**, the drum **1030**, the user input interface **1100**, the display **1200**, the communication interface **1300**, the charger **1400**, the dryer **1500**, and the memory **1700** by executing the programs stored in the memory **1700**. The controller **1600** may control operations of the garment treatment apparatus **1000**, which are disclosed in the specification, by controlling the door **1020**, the drum **1030**, the user input interface **1100**, the display **1200**, the communication interface **1300**, the charger **1400**, the dryer **1500**, and the memory **1700**.

The controller **1600** may receive movement information associated with movement of the monitoring device **2000** from the monitoring device **4000** placed inside the drum **1030**. When the controller **1600** executes an operation for treating garments, the drum **1030** of the garment treatment apparatus **1000** may rotate. In addition, according to the rotation of the drum **1030**, the garments and the monitoring device **2000** inside the drum **1030** may move. The monitoring device **2000** may acquire movement information indicating a moving direction, a moving speed, an acceleration, and an acceleration change of the monitoring device **2000** by using a sensor inside monitoring device **2000**. In addition the monitoring device **2000** may transmit the acquired movement information to the garment treatment apparatus **1000** in real-time. The controller **1600** may control the rotation of the drum **1030** based on the received movement information. The controller **1600** may change a rotating speed of the drum **1030**, a speed of a motor for rotating the drum **1030**, a rotating direction of the drum **1030**, and a rotating pattern of the drum **1030** based on the movement information received from the monitoring device **2000**.

When an operation for garment treatment starts, the controller **1600** may repeat an operation of rotating and suspending the drum **1030** for a certain time to estimate an amount of garments inside the drum **1030**. In addition, the controller **1600** may control the rotation of the drum **1030** by considering both the estimated amount of the garments and the movement information received from the monitoring device **2000**.

The controller **1600** may change the rotating speed of the drum **1030**. The controller **1600** may estimate an amount of garments inside the drum **1030** at the beginning of a dry function and determine the rotating speed and the rotating direction of the drum **1030** based on the estimated amount of the garments In addition the controller **1600** may estimate a rotating speed and a rotating direction of the garments according to the determined rotating speed and rotating direction of the drum **1030**. In addition, in the middle of the rotation of the drum **1030**, the controller **1600** may change at least one of the rotating speed or the rotating direction of the drum **1030** based on a moving speed and a moving direction received from the monitoring device **2000**. When the moving speed of the monitoring device **2000** differs from the estimated moving speed of the garments, the controller **1600** may change the rotating speed of the drum **1030**.

The controller **1600** may change a drying time. The controller **1600** may estimate an amount of garments inside the drum **1030** at the beginning of the dry function and determine a drying time for which a drying operation is executed, based on the estimated amount of the garments. In addition, the controller **1600** may estimate an acceleration of the garments based on the estimated amount of the garments and the rotating speed of the drum **1030**. The garments may drop from a high position to a low position inside the drum **1030** while moving inside the drum **1030** in a clockwise or counterclockwise direction. In addition, in the middle of the rotation of the drum **1030**, the controller **1600** may change the drying time of the garment treatment apparatus **1000** based on the acceleration of the monitoring device **2000**, which is received from the monitoring device **2000**. When the acceleration of the monitoring device **2000** differs from the estimated acceleration of the garments, the controller **1600** may change the drying time.

The controller **1600** may identify a change in the acceleration of the monitoring device **2000**. The controller **1600** may cumulatively store acceleration data of the monitoring device **2000**, which is received from the monitoring device **2000**, and compare the cumulatively stored acceleration data.

The controller **1600** may analyze a movement history of the monitoring device **2000**. The controller **1600** may analyze a movement history about movement of the monitoring device **2000** during execution of the dry function of the garment treatment apparatus **1000** based on a history of moving directions and moving speeds of the monitoring device **2000**.

The controller **1600** may determine the rotating pattern of the drum **1030**. The controller **1600** may estimate how the garments inside the drum **1030** have been entangled, based on history information about the moving directions and the moving speeds of the monitoring device **2000**. The controller **1600** may determine a rotating pattern of the drum **1030** for disentangling the entangled garments inside the drum **1030**, based on the history information about the moving directions and the moving speeds of the monitoring device **2000**. The controller **1600** may determine the rotating pattern of the drum **1030** by using a certain learning model for determining the rotating pattern of the drum **1030** to disentangle the entangled garments. The certain learning model for determining the rotating pattern of the drum **1030** to disentangle the entangled garments may be a learning model trained using an artificial intelligence algorithm that is at least one of, for example, a machine learning algorithm, a neural network algorithm, a genetic algorithm, a deep learning algorithm, or a classification algorithm.

The controller **1600** may execute an operation for disentangling the garments. The controller **1600** may control the rotation of the drum **1030** inside the garment treatment apparatus **1000** according to the acquired rotating pattern of the drum **1030**.

The controller **1600** may change the drying time of the garment treatment apparatus **1000** based on humidity information received from the monitoring device **2000**. The controller **1600** may change the drying time for which a drying operation is executed, by considering both humidity measured by a humidity sensor of the garment treatment apparatus **1000** and humidity measured by the monitoring device **2000** in the middle of the execution of the drying operation.

FIG. **4** is a block diagram of the monitoring device **2000** according to an embodiment of the disclosure, and FIG. **5** is a block diagram of a sensor **2200** according to an embodiment of the disclosure.

Referring to FIG. **4**, the monitoring device **2000** may include a communication interface **2100**, the sensor **2200**, a charger **2300**, a memory **2400**, a processor **2500**, and a battery **2600**.

The communication interface **2100** may include one or more components for communicating with the garment treatment apparatus **1000** and a mobile device (not shown). For example, the communication interface **2100** may include a short-range wireless communication interface. The short-range wireless communication interface may include a Bluetooth communication interface, a BLE communication interface an NFC interface, a Wi-Fi communication interface, a Zigbee communication interface an IrDA communication interface, a WFD communication interface, a UWB communication interface, an Ant+ communication interface, and the like but is not limited thereto.

The sensor **2200** may sense a state of the monitoring device **2000** or an ambient state of the monitoring device **2000**. The sensor **2200** may include a gyro sensor **2210**, an acceleration sensor **2220**, a humidity sensor **2230**, and a detergent detection sensor **2240**. In addition, the sensor **2200** may include, for example, a geomagnetic sensor, a temperature sensor, and the like but is not limited thereto. In addition, the detergent detection sensor **2240** may include, for example, an olfactory sensor and a spectral measurement sensor but is not limited thereto. A function of each sensor may be intuitively inferred by those of ordinary skill in the art from a name thereof, and thus a detailed description thereof is omitted herein.

In addition, the monitoring device **2000** may have a spherical shape, and the sensor **2200** may be embedded in the monitoring device **2000**. Some sensors included in the sensor **2200** may be located at a central part of the monitoring device **2000**, and the other sensors included in the sensor **2200** may be exposed to the outside. For example, the geomagnetic sensor, acceleration sensor **2220**, and the gyro sensor **2210** may be provided at the central part of the monitoring device **2000**, and the temperature sensor and the humidity sensor **2230** may be provided to an outer circumferential part so as to be exposed to the outside.

The charger **2300** may charge the battery **2600**. The charger **2300** may charge the battery **2600** in a wired or wireless manner based on a current provided from the garment treatment apparatus **1000**.

The memory **2400** may store a program for controlling the monitoring device **2000** and store data acquired by the monitoring device **2000** or data to be output from the monitoring device **2000**. The memory **2400** may include at least one type of storage medium among a flash memory type memory, a multimedia card micro type memory, a card type memory (e.g., an SD or XD memory), RAM, SRAM, ROM, EEPROM, and PROM.

The processor **2500** controls a general operation of the monitoring device **2000**. For example, the processor **2500** may generally control the communication interlace **2100**, the sensor **2200**, the charger **2300**, the memory **2400**, and the battery **2600** by executing programs stored in, the memory **2400**. The processor **2500** may control operations of the monitoring device **2000**, which are disclosed in the specification, by generally controlling the communication interface **2100**, the sensor **2200**, the charger **2300** the memory **2400**, and the battery **2600**.

The processor **2500** may be connected, via communication, to the garment treatment apparatus **1000**. The processor **2500** may be connected, via communication, to the garment treatment apparatus **1000** through Bluetooth communication or Wi-Fi communication.

The garment treatment apparatus **1000** may transmit, to the monitoring device **2000**, a signal indicating initiation of a monitoring operation of the monitoring device **2000**, and the processor **2500** may activate a function of monitoring a state of the inside of the drum **1030** in response to an activation command of the garment treatment apparatus **1000**.

The processor **2500** may measure a moving direction of the monitoring device **2000**. According to rotation of the drum **1030** in the garment treatment apparatus **1000** in the clockwise or counterclockwise direction, the monitoring device **2000** may move in the clockwise or counterclockwise direction together with garments. In addition, the processor **2500** may monitor movement of the monitoring device **2000** by using the sensor **2200** and acquire sensing data about a moving direction of the monitoring device **2000**. The processor **2500** may acquire the sensing data about the moving direction of the monitoring device **2000** by using, for example, a motion sensor and the gyro sensor **2210**. The processor **2500** may periodically measure a moving direction of the monitoring device **2000** in a certain period. The processor **2500** may measure moving directions of the monitoring device **2000** for a certain time range. The pro-

cessor **2500** may measure a moving speed of the monitoring device **2000**. In addition, the processor **2500** may monitor movement of the monitoring device **2000** by using the sensor **2200** and acquire sensing data about a moving speed of the monitoring device **2000**. The processor **2500** may acquire the sensing data about the moving speed of the monitoring device **2000** by using, for example, the motion sensor and the gyro sensor **2210**. The processor **2500** may periodically measure a moving speed of the monitoring device **2000** in a certain period. The processor **2500** may measure moving speeds of the monitoring device **2000** for a certain time range. The processor **2500** may transmit information about a moving direction and a moving speed to the garment treatment apparatus **1000**. The processor **2500** may transmit real-time sensing data about a moving direction and a moving speed to the garment treatment apparatus **1000**.

The processor **2500** may measure an acceleration of the monitoring device **2000**. The processor **2500** may measure an acceleration of the monitoring device **2000** by using the acceleration sensor **2220** and acquire sensing data indicating the acceleration of the monitoring device **2000**. The processor **2500** may periodically measure an acceleration of the monitoring device **2000** in a certain period. The processor **2500** may measure accelerations of the monitoring device **2000** for a certain time range. The processor **2500** may transmit information about an acceleration to the garment treatment apparatus **1000**. The processor **2500** may transmit real-time sensing data about an acceleration of the monitoring device **2000** to the garment treatment apparatus **1000**.

The processor **2500** may measure ambient humidity of the monitoring device **2000**. The processor **2500** may measure ambient humidity of the monitoring device **2000** by using the humidity sensor **2230** and acquire sensing data indicating the ambient humidity of the monitoring device **2000**. The processor **2500** may periodically measure ambient humidity of the monitoring device **2000** in a certain period. The processor **2500** may transmit information about humidity to the garment treatment apparatus **1000**. The processor **2500** may transmit real-time sensing data about ambient humidity of the monitoring device **2000** to the garment treatment apparatus **1000**.

FIG. **6** illustrates an example in which the monitoring device **2000** moves in the garment treatment apparatus **1000**, according to an embodiment of the disclosure.

Referring to FIG. **6**, the drum **1030** of the garment treatment apparatus **1000** may rotate in the clockwise or counterclockwise direction. According to the rotation of the drum **1030**, the monitoring device **2000** placed inside the drum **1030** may move in the clockwise or counterclockwise direction. The monitoring device **2000** may be manufactured in, for example, a spherical shape and move inside the drum **1030** together with garments placed inside the drum **1030**. Movement of the monitoring device **2000** inside the drum **1030** may vary depending on a rotating speed of the drum **1030**, an amount of garments inside the drum **1030**, and entanglement of the garments inside the drum **1030**. The monitoring device **2000** may transmit movement information associated with the movement of the monitoring device **2000** to the garment treatment apparatus **1000**.

FIG. **7** is a flowchart of a method, performed by the garment treatment apparatus **1000**, of controlling an operation of the garment treatment apparatus **1000** by inter working with the monitoring device **2000**, according to an embodiment of the disclosure.

In operation S**700**, garments and the monitoring device **2000** may be placed inside the drum **1030**. The garments and the monitoring device **2000** may be placed inside the drum **1030** by a user before the garment treatment apparatus **1000** executes an operation for garment treatment.

In operation S**710** the garment treatment apparatus **1000** may receive movement information associated with movement of the monitoring device **2000** from the monitoring device **2000** placed inside the drum **1030**. When the garment treatment apparatus **1000** executes an operation for garment treatment, the drum **1030** of the garment treatment apparatus **1000** may rotate. In addition, according to the rotation of the drum **1030**, the garments and the monitoring device **2000** inside the drum **1030** may move. The monitoring device **2000** may acquire movement information indicating a moving direction, a moving speed, an acceleration, an acceleration change, and the like of the monitoring device **2000** by using a sensor inside the monitoring device **2000**. In addition, the monitoring device **2000** may transmit the acquired movement information to the garment treatment apparatus **1000** in real-time.

In operation S**720**, the garment treatment apparatus **1000** may control the rotation of the drum **1030** based on the received movement information. The garment treatment apparatus **1000** may change a rotating speed of the drum **1030**, a speed of a motor for rotating the drum **1030**, a rotating direction of the drum **1030**, and a rotating pattern of the drum **1030** based on the movement information received from the monitoring device **2000**.

When the operation for garment treatment starts, the garment treatment apparatus **1000** may repeat an operation of rotating and suspending the drum **1030** for a certain time to estimate an amount of the garments inside the drum **1030**. In addition, the garment treatment apparatus **1000** may control rotation of the drum **1030** by considering both the estimated amount of the garments and the movement information received from the monitoring device **2000**.

FIG. **8** is a signaling diagram a method, performed by the garment treatment apparatus **1000**, of changing a rotating speed of the drum **1030** of the garment treatment apparatus **1000** based on a roving direction and a moving speed of the monitoring device **2000**, according to an embodiment of the disclosure.

In operation S**800**, garments and the monitoring device **2000** may be placed inside the drum **1030**. The garments and the monitoring device **2000** may be placed inside the drum **1030** by a user before the garment treatment apparatus **1000** executes an operation for garment treatment.

In operation S**805**, the garment treatment apparatus **1000** may be connected, via communication, to the monitoring device **2000**. When power is applied to the garment treatment apparatus **1000**, the garment treatment apparatus **1000** may be connected, via communication, to the monitoring device **2000**. Alternatively, when the garment treatment apparatus **1000** receives a Users input for garment treatment, the garment treatment apparatus **1000** may be connected, via communication, to the monitoring device **2000**. The garment treatment apparatus **1000** may be connected, via communication, to the monitoring device **2000** through, for example, Bluetooth communication or Wi-Fi communication.

In operation S**810**, the garment treatment apparatus **1000** may activate the dry function. Upon receiving the user's input for executing the dry function, the garment treatment apparatus **1000** may activate the dry function of drying the garments inside the drum **1030**.

In operation S**815**, the garment treatment apparatus **1000** may transmit an activation command to the monitoring device **2000**. The garment treatment apparatus **1000** may transmit, to the monitoring device **2000**, a signal indicating initiation of a monitoring operation of the monitoring device

2000. The monitoring device 2000 may activate a function of monitoring a state of the inside of the drum 1030 in response to the activation command of the garment treatment apparatus 1000.

In operation S820 the monitoring device 2000 may measure a moving direction of the monitoring device 2000. When the drum 1030 of the garment treatment apparatus 1000 rotates in the clockwise or counterclockwise direction, the monitoring device 2000 may rotate in the clockwise or counterclockwise direction together with the garments. In addition, the monitoring device 2000 may monitor movement of the monitoring device 2000 by using a sensor and acquire sensing data about the moving direction of the monitoring device 2000. The monitoring device 2000 may acquire the sensing data about the moving direction of the monitoring device 2000 by using, for example a motion sensor and a gyro sensor.

The monitoring device 2000 may generate movement information associated with, for example, whether the monitoring device 2000 moves in the clockwise or counterclockwise direction but is not limited thereto. The monitoring device 2000 may periodically measure a moving direction of the monitoring device 2000 in a certain period. The monitoring device 2000 may measure moving directions of the monitoring device 2000 for a certain time range.

In operation S825, the monitoring device 2000 may measure a moving speed of the monitoring device 2000. In addition, the monitoring device 2000 may monitor movement of the monitoring device 2000 by using a sensor and acquire sensing data about the moving speed of the monitoring device 2000. The monitoring device 2000 may acquire the sensing data about the moving speed of the monitoring device 2000 by using, for example, the motion sensor and the gyro sensor. The monitoring device 2000 may periodically measure a moving speed of the monitoring device 2000 in a certain period. The monitoring device 2000 may measure moving speeds of the monitoring device 2000 for a certain time range.

In operation S830, the monitoring device 2000 may transmit information about the moving direction and the moving speed to the garment treatment apparatus 1000. The monitoring device 2000 may transmit real-time sensing data about a moving direction and a moving speed to the garment treatment apparatus 1000.

In operation S835, the monitoring device 2000 may change a rotating speed of the drum 1030. When the dry function starts, the garment treatment apparatus 1000 may estimate an amount of the garments inside the drum 1030 and determine a rotating speed and a rotating direction of the drum 1030 based on the estimated amount of the garments. In addition, the garment treatment apparatus 1000 may estimate a moving speed and a moving direction of the garments according to the rotating speed and the rotating direction of the drum 1030. In addition, in the middle of the rotation of the drum 1030, the garment treatment apparatus 1000 may change at least one of the rotating speed or the rotating direction of the drum 1030 based on the moving direction and the moving speed received from the monitoring device 2000.

When the moving speed of the monitoring device 2000 differs from the estimated moving speed of the garments, the garment treatment apparatus 1000 may change the rotating speed of the drum 1030. For example, when the moving speed of the monitoring device 2000 is less than the estimated moving speed of the garments, the garment treatment apparatus 1000 may increase the rotating speed of the drum 1030. For example, when the moving speed of the monitoring device 2000 is greater than the estimated moving speed of the garments, the garment treatment apparatus 1000 may decrease the rotating speed of the drum 1030. In addition, when the moving direction of the monitoring device 2000 differs from the estimated moving direction of the garments, the garment treatment apparatus 1000 may change the rotating direction of the drum 1030.

FIG. 9 is a signaling diagram of a method, performed by the garment treatment apparatus 1000, of changing a drying time of the garment treatment apparatus 1000 based on an acceleration of the monitoring device 2000, according to an embodiment of the disclosure.

Operations S900 to S915 correspond to operations S800 to S815, and thus, a description of operations S900 to S915 is omitted for convenience of description.

In operation S920, the monitoring device 2000 may measure an acceleration of the monitoring device 2000. When the drum 1030 of the garment treatment apparatus 1000 rotates in the clockwise or counterclockwise direction the monitoring device 2000 may rotate in the clockwise or counterclockwise direction together with the garments. The monitoring device 2000 may drop from a high position to a low position inside the drum 1030 while moving inside the drum 1030 in the clockwise or counterclockwise direction. While the monitoring device 2000 is dropping from a high position to a low position inside the drum 1030, a speed of the monitoring device 2000 may change, and accordingly, the monitoring device 2000 may measure an acceleration of the monitoring device 2000.

The monitoring device 2000 may measure an acceleration of the monitoring device 2000 by using an acceleration sensor and acquire sensing data indicating the acceleration of the monitoring device 2000. The monitoring device 2000 may periodically measure an acceleration of the monitoring device 2000 in a certain period. The monitoring device 2000 may measure accelerations of the monitoring device 2000 for a certain time range.

In operation S925, the monitoring device 2000 may transmit information about the acceleration to the garment treatment apparatus 1000. The monitoring device 2000 may transmit real-time sensing data about an acceleration of the monitoring device 2000 to the garment treatment apparatus 1000.

In operation S930, the garment treatment apparatus 1000 may change a drying time. The garment treatment apparatus 1000 may estimate an amount of garments inside the drum 1030 at the beginning of the dry function and determine a drying time for which a drying operation is executed, based on the estimated amount of the garments. In addition, the garment treatment apparatus 1000 may estimate an acceleration of the garments according to the estimated amount of the garments and a rotating direction of the drum 1030. The garments may drop from a high position to a low position inside the drum 1030 while moving inside the drum 1030 in the clockwise or counterclockwise direction. While the garments is dropping from a high position to a low position inside the drum 1030, an acceleration of the garments is generated, and the garment treatment apparatus 1000 may estimate the acceleration of the garments based on the estimated amount of the garments, a capacity of the drum 1030, and the rotating direction of the drum 1030.

In addition, in the middle of the rotation of the drum 1030, the garment treatment apparatus 1000 may change a drying time of the garment treatment apparatus 1000 based on the acceleration of the monitoring device 2000, which is received from the monitoring device 200. When the acceleration of the monitoring device 2000 differs from the

estimated acceleration of the garments, the garment treatment apparatus **1000** may change the drying time. For example, when the acceleration of the monitor ng device **2000** is less than the estimated acceleration of the garments, because the estimated amount of the garments is less than an actual amount of garments placed inside the drum **1030**, the garment treatment apparatus **1000** may increase the drying time. For example, when the acceleration of the monitoring device **2000** is greater than the estimated acceleration of the garments, because the estimated amount of the garments is greater than the actual amount of the garments placed inside the drum **1030**, the garment treatment apparatus **1000** may decrease the drying time.

FIG. **10** is a signaling diagram of a method, performed by the garment treatment apparatus **1000**, of disentangling garments in the garment treatment apparatus **1000** based on an acceleration change of the monitoring device **2000**, according to an embodiment of the disclosure.

Operations S**1000** to S**1015** correspond to operations S**800** to S**815**, and thus, a description of operations S**1000** to S**1015** is omitted for convenience of description.

In operation S**1020**, the monitoring device **2000** away periodically measure an acceleration of the monitoring device **2000**. The monitoring device **2000** may periodically measure an acceleration of the monitoring device **2000** by using an acceleration sensor and periodically acquire sensing data indicating the acceleration of the monitoring device **2000**. The monitoring device **2000** may acquire history information about changes in an acceleration of the monitoring device **2000**.

In operation S**1025**, the monitoring device **2000** may transmit history information of periodically measured accelerations to the garment treatment apparatus **1000**. The monitoring device **2000** may transmit a plurality of pieces of real-time sensing data about accelerations of the monitoring device **2000** to the garment treatment apparatus **1000**.

In operation S**1030**, the garment treatment apparatus **1000** may identify an acceleration change of the monitoring device **2000**. The garment treatment apparatus **1000** may cumulatively store acceleration data of the monitoring device **2000**, which is received from the monitoring device **2000**, and compare the cumulatively stored acceleration data. For example, when the accelerations of the monitoring device **2000** have gradually decreased, the garment treatment apparatus **1000** may determine to at garments inside the drum **1030** has been entangled. In addition, when the accelerations of the monitoring device **2000** have gradually increased, the garment treatment apparatus **1000** may determine that entangled garments inside the drum **1030** has been disentangled.

In operation S**1035**, the garment treatment apparatus **1000** may analyze a movement history of the monitoring device **2000**. The garment treatment apparatus **1000** may receive real-time information about a moving direction, and a moving speed of the monitoring device **2000**. The garment treatment apparatus **1000** may analyze a movement history about how the monitoring device **2000** has moved while the garment treatment apparatus **1000** has been executing the dry function, based on a history of moving directions and moving speeds of the monitoring device **2000**.

In operation S**1040**, the garment treatment apparatus **1000** may determine a rotating pattern of the drum **1030**. The garment treatment, apparatus **1000** may estimate how the garments inside the drum **1030** have been entangled, based on history information about the moving directions and the moving speeds of the monitoring device **2000**. For example, the garment treatment apparatus **1000** may estimate the garments inside the drum **1030** have been entangled, based on a movement history of the monitoring device **2000**, a rotating pattern of the drum **1030** while performing the dry function, and an amount of the garments inside the drum **1030**.

In addition, the garment treatment apparatus **1000** may determine a rotating pattern of the drum **1030** to disentangle entangled garments inside the drum **1030**, based on the history information about the moving directions and the moving speeds of the monitoring device **2000**. For example, the garment treatment apparatus **1000** may determine the rotating pattern of the drum **1030** to disentangle entangled garments inside the drum **1030**, based on the movement history of the monitoring device **2000**, the rotating pattern of the drum **1030** while performing the dry function, the amount of the garments inside the drum **1030** and a type of the garments inside the drum **1030**.

In this case, the garment treatment apparatus **1000** may determine a rotating pattern of the drum **1030** by using a certain learning model for determining the rotating pattern of the drum **1030** to disentangle the entangled garments. The certain learning model for determining the rotating pattern of the drum **1030** to disentangle the entangled garments may be a learning model trained using an artificial intelligence algorithm that is at least one of, for example, a machine learning algorithm, a neural network algorithm, a genetic algorithm, a deep learning algorithm, or a classification algorithm. In addition, for example, the garment treatment apparatus **1000** may acquire a rotating pattern output from the learning model by inputting, into the learning model, data about the movement history of the monitoring device **2000**, the rotating pattern of the drum **1030** while performing the dry function, the amount of the garments inside the drum **1030**, and the type of the garments inside the drum **1030**.

In operation S**1045**, the garment treatment apparatus **1000** may execute an operation for disentangling the garments. The garment treatment apparatus **1000** may control rotation of the drum **1030** in the garment treatment apparatus **1000** according to the rotating pattern of the drum **1030**, which is acquired in operation S**1040**. The garment treatment apparatus **1000** may receive real-time information about an acceleration of the monitoring device **2000** frown the monitoring device **2000** while controlling rotation of the drum **1030** according to the rotating pattern of the drum **1030**, which is acquired in operation S**1040**. In addition, the garment treatment apparatus **1000** may monitor whether the garments inside the drum **1030** has been disentangled, based on the received real-time acceleration information. When the garments are not disentangled for a certain time, the garment treatment apparatus **1000** may change the rotating pattern of the drum **1030**.

Although FIGS. **8** to **10** show examples of operations of the garment treatment apparatus **1000** interworking the monitoring device **2000** when the garment treatment apparatus **1000** executes the dry function, the embodiments are not limited thereto. For example, even when the garment treatment apparatus **1000** executes a garment treatment operation such as a washing function or a rinsing function, the operations of FIGS. **8** to **10** may be applied.

When the garment treatment apparatus **1000** executes the washing function and the rinsing function, the monitoring device **2000** may measure a concentration of a detergent by using a sensor and transmit the measured concentration of the detergent to the garment treatment apparatus **1000**. The garment treatment apparatus **1000** may control a function of treating garments based on the concentration received from

the monitoring device **2000**. For example, the garment treatment apparatus **1000** may adjust a washing time, a washing strength, and a rinsing time. When the garment treatment apparatus **1000** executes the rinsing function and a dehydrating function, the monitoring device **2000** may detect a residual amount of the detergent on the garments by using a detergent detection sensor. When a numeric value of the detected residual amount of the detergent exceeds a certain threshold, the garment treatment apparatus **1000** may output an alarm signal for notifying the user that the residual amount of the detergent is great.

When the garment treatment apparatus **1000** executes the dry function, the monitoring device **2000** may detect a residual amount of the detergent on the garments by using a detergent detection sensor including an olfactory sensor and a spectral measurement sensor. When a numeric value of the detected residual amount of the detergent exceeds a certain threshold, the garment treatment apparatus **1000** may output an alarm signal for notifying the user that the residual amount of the detergent is great.

FIG. **11** is a signaling diagram of a method, performed by the garment treatment apparatus **1000** of changing a drying time of the garment treatment apparatus **1000** based on ambient humidity of the monitoring device **2000**, according to an embodiment of the disclosure.

Operations S**1100** to S**1115** correspond to operations S**800** to S**815**, and thus, a description of operations S**1100** to S**1115** is omitted for convenience of description.

In operation S**1120**, the monitoring device **2000** may measure ambient humidity of the monitoring device **2000**. The monitoring device **2000** may measure ambient humidity of the monitoring device **2000** by using a humidity sensor and acquire sensing data indicating the ambient humidity of the monitoring, device **2000**. The monitoring device **2000** may periodically measure ambient humidity of the monitoring device **2000** in a certain period.

In operation S**1125**, the monitoring device **2000** may transmit information about the humidity to the garment treatment apparatus **1000**. The monitoring device **2000** may transmit real-time sensing data about ambient humidity of the monitoring device **2000** to the garment treatment apparatus **1000**.

In operation S**1130**, the garment treatment apparatus **1000** may change a drying time. The garment treatment apparatus **1000** may change the drying time for which a drying operation is executed, by considering, both humidity measured by a humidity sensor of the garment treatment apparatus **1000** and humidity measured by the monitoring device **2000** in the middle of the execution of the drying operation. Accordingly, the garment treatment apparatus **1000** may adjust the drying time by considering both humidity of an edge part of the drum **1030** and humidity of a central part of the drum **1030** in a space inside the drum **1030**.

For example, when the humidity measured by the humidity sensor of the garment treatment apparatus **1000** and the humidity measured by the monitoring device **2000** are less than a certain threshold, the garment treatment apparatus **1000** may reduce the drying time or end the drying operation. For example, when the humidity measured by the humidity sensor of the garment treatment apparatus **1000** is greater than the certain threshold, and the humidity measured by the monitoring device **2000** is less than the certain threshold, the garment treatment apparatus **1000** may increase the drying time. For example, when the humidity measured by the humidity sensor of the garment treatment apparatus **1000** is less than the certain threshold, and the humidity measured by the monitoring device **2000** is greater than the certain threshold, the garment treatment apparatus **1000** may decrease the drying time.

FIG. **12** illustrates an example in which the garment treatment apparatus **1000** charges the monitoring device **2000**, according to an embodiment of the disclosure.

Referring to FIG. **12**, the drum **1030** may include a charging groove **1040** and a guide part **1050**. The charging groove **1040** may provide a function of fixing the monitoring device **2000** and charging the monitoring device **2000**.

The guide part **1050** may provide a function of guiding the monitoring device **2000** such that the monitoring device **2000** may move to the inside of the charging groove **1040**.

After a garment treatment operation of the garment treatment apparatus **1000** ends and the user takes garments inside the drum **1030** out of the drum **1030**, the garment treatment apparatus **1000** may slowly rotate the drum **1030**. Accordingly, the monitoring device **2000** may move to the inside of the charging groove **1040** by rolling along the guide part **1050**. When the monitoring device **2000** is located inside the charging groove **1040**, the garment treatment apparatus **1000** may activate a function of charging a battery of the monitoring device **2000**.

FIG. **13** is a flowchart of a method, performed by the garment treatment apparatus **1000**, of charging the monitoring device **2000**, according to an embodiment of the disclosure.

In operation S**1300**, the garment treatment apparatus **1000** may end a garment treatment operation. The garment treatment apparatus **1000** may end the garment treatment operation after completing garment treatment. After the garment treatment operation ends, the user may take garments inside the drum **1030** out of the garment treatment apparatus **1000**.

In operation S**1310**, the garment treatment apparatus **1000** may rotate the drum **1030** at a certain speed. The garment treatment apparatus **1000** may sense that the garments inside the drum **1030** have disappeared, and slowly rotate the drum **1030** of the garment treatment apparatus **1000** at the certain speed or less. Alternatively, the garment treatment apparatus **1000** may slowly rotate the drum **1030** of the garment treatment apparatus **1000** at the certain speed or less based on the users input. Accordingly, the monitor ng device **2000** may roll along an inner circumferential surface of the drum **1030** and seat inside the charging groove **1040** by passing through the guide part **1050**.

In operation S**1320**, the garment treatment apparatus **1000** may identify whether the monitoring device **2000** is located inside the charging groove **1040**. The garment treatment apparatus **1000** may identify whether the monitoring device **2000** is located inside the charging groove **1040** when the monitoring device **2000** is located inside the charging groove **1040**.

In operation S**1330**, the garment treatment apparatus **1000** may activate a charging function. The garment treatment apparatus **1000** may charge a battery inside the monitoring device **2000** by activating a wireless charging function. Alternatively, the garment treatment apparatus **1000** may charge the battery inside the monitoring device **2000** by activating a wired charging function. When a charging terminal (not shown) provided to the monitoring device **2000** comes in contact with a charging terminal (not shown) inside the charging groove **1040**, the garment treatment apparatus **1000** may charge the monitoring device **2000** in a wired manner.

An embodiment of the disclosure may be implemented in a form of a recording medium including computer-executable instructions such as a program module executed by a computer system. A computer-readable medium may be an

arbitrary available medium which may be accessed by a computer system and includes all types of volatile and non-volatile media and separated and non-separated media. In addition, the computer-readable medium may include all types of computer storage media and communication media. The computer storage media include all types of volatile and non-volatile and separated and non-separated media implemented by an arbitrary method or technique for storing information such as computer-readable instructions, a data structure, a program module, or other data.

The communication media typically include computer-readable instructions, a data structure, a program module, other data of a modulated signal.

In addition, in the present specification, "unit, interface, or -er (or)" may indicate a hardware component such as a processor or a circuit and/or a software component executed by a hardware component such as a processor.

The embodiments of the disclosure described above are only illustrative, and it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without changing the technical spirit and mandatory features of the disclosure. Therefore, the embodiments of the disclosure should be understood in the illustrative sense only and not for the purpose of limitation in all aspects. For example, each component described as a single type may be carried out by being distributed, and likewise, components described as a distributed type may also be carried out by being coupled.

While one or more embodiments of the disclosure have been described with reference to the figures, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope as defined by the following claims.

What is claimed is:

1. A method, performed by a garment treatment apparatus, of controlling an operation of the garment treatment apparatus, the method comprising:

establishing wireless communication with a monitoring device placed inside a drum of the garment treatment apparatus;

rotating the drum to treat garments;

receiving movement information associated with movement of the monitoring device from the monitoring device during the rotating of the drum;

controlling the rotating of the drum based on the movement information received;

rotating the drum at a certain speed after ending treatment of the garments;

identifying whether the monitoring device is located inside a charging groove in the drum; and

activating a function of charging the monitoring device when the monitoring device is identified as being located inside the charging groove,

wherein the monitoring device moves in the drum, that is rotating, together with the garments in the garment treatment apparatus.

2. The method of claim **1**, wherein the receiving of the movement information comprises receiving information about a moving speed of the monitoring device, and

the controlling of the rotating of the drum comprises controlling a rotating speed of the drum based on the moving speed of the monitoring device.

3. The method of claim **2**, wherein the receiving of the movement information comprises receiving information about a moving direction of the monitoring device, and

the controlling of the rotating of the drum comprises controlling the rotating speed of the drum based on the moving speed and the moving direction of the monitoring device.

4. The method of claim **1**, wherein the receiving of the movement information comprises receiving information about an acceleration of the monitoring device, and

the method further comprises changing an operating time of the garment treatment apparatus based on the acceleration of the monitoring device.

5. The method of claim **4**, wherein the receiving of the movement information comprises periodically receiving information about the acceleration of the monitoring device, and

the method further comprises executing a function of disentangling the garments, based on a change history of the acceleration of the monitoring device.

6. The method of claim **5**, further comprising determining a rotating pattern of the drum to disentangle the garments, based on a movement history of the monitoring device,

wherein the executing of the function of disentangling the garments comprises controlling rotation of the drum based on the rotating pattern of the drum that is determined.

7. The method of claim **1**, further comprising:

receiving humidity information about ambient humidity of the monitoring device from the monitoring device; and

changing an operating time of the garment treatment apparatus based on the humidity information received.

8. The method of claim **1**, wherein the monitoring device moves to the charging groove by a guide part formed along an inner circumferential surface of the drum rotating at the certain speed.

9. The method of claim **1**, wherein the garment treatment apparatus comprises at least one of a washer or a dryer.

10. A garment treatment apparatus configured to communicate with a monitoring device, the garment treatment apparatus comprising:

a communication interface configured to wirelessly communicate with the monitoring device;

a drum configured to accommodate garments and the monitoring device therein;

a memory storing one or more instructions; and

a controller configured to execute the one or more instructions stored in the memory,

wherein the controller is further configured, by executing the one or more instructions, to:

establish wireless communication with the monitoring device put into the drum,

rotate the drum to treat the garments,

receive movement information associated with movement of the monitoring device from the monitoring device during the rotating of the drum,

control the rotating of the drum based on the movement information received,

rotate the drum at a certain speed after ending treatment of the garments,

identify whether the monitoring device is located inside a charging groove in the drum, and

activate a function of charging the monitoring device when the monitoring device is identified as being located inside the charging groove,

wherein, in a case where the drum is rotating, the monitoring device moves in the drum together with the garments in the garment treatment apparatus.

11. The garment treatment apparatus of claim 10, wherein the controller is further configured, by executing the one or more instructions, to:

receive information about a moving speed of the monitoring device, and

control a rotating speed of the drum based on the moving speed of the monitoring device.

12. The garment treatment apparatus of claim 11, wherein the controller is further configured, by executing the one or more instructions, to:

receive information about a moving direction of the monitoring device,

wherein the controller is configured to control the rotating speed of the drum based on the moving speed and the moving direction of the monitoring device.

13. The garment treatment apparatus of claim 10, wherein the controller is further configured, by executing the one or more instructions, to:

receive information about an acceleration of the monitoring device, and

change an operating time of the garment treatment apparatus based on the acceleration of the monitoring device.

14. The garment treatment apparatus of claim 13, wherein the controller is further configured, by executing the one or more instructions, to:

periodically receive information about the acceleration of the monitoring device, and

execute a function of disentangling the garments, based on a change history of the acceleration of the monitoring device.

15. The garment treatment apparatus of claim 14, wherein the controller is further configured, by executing the one or more instructions, to:

determine a rotating pattern of the drum to disentangle the garments, based on a movement history of the monitoring device, and

control rotation of the drum based on the rotating pattern of the drum that is determined.

16. The garment treatment apparatus of claim 10, wherein the controller is further configured, by executing the one or more instructions, to:

receive humidity information about ambient humidity of the monitoring device from the monitoring device, and

change an operating time of the garment treatment apparatus based on the humidity information received.

17. The garment treatment apparatus of claim 10, wherein

the drum further comprises a guide part formed along an inner circumferential surface of the drum, and

the monitoring device moves to the charging groove by the guide part of the drum in a case where the drum is rotating at the certain speed.

18. A system comprising:

the garment treatment apparatus according to claim 10; and

the monitoring device, wherein the monitoring device comprises:

a communication interface configured to wirelessly communicate with the garment treatment apparatus;

a sensor;

a memory storing one or more instructions; and

a processor configured to execute the one or more instructions stored in the memory of the monitoring device,

wherein the processor of the monitoring device is further configured, by executing the one or more instructions stored in the memory of the monitoring device, to:

establish wireless communication with the garment treatment apparatus,

sense the movement of the monitoring device, caused by rotation of the drum of the garment treatment apparatus, during the rotation of the drum, and

provide the movement information associated with the movement of the monitoring device to the garment treatment apparatus.

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